Journal of Physical Education and Sport ® (JPES), Vol. 22 (issue 12), Art 393, pp. 3101-3113, December 2022
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

What alternative supplements are prominent between some of female athletes?: A systematic review

SEPTA KATMAWANTI[1]*, SAREENA HANIM[2], SITI KHUZAIMAH AHMAD SHARONI[3], ROSUZEITA FAUZI[4], DEA AFLAH SAMAH[5], OKTAVIA SRI WAHYUNI[6],
[1,5,6,]Department of Public Health, Universitas Negeri Malang, INDONESIA
[2]Centre for and Exercise Sports Science, University of Malaya, MALAYSIA
[3,4]Centre for Nursing Studies, Universiti Teknologi MARA, MALAYSIA

Published online: December 25, 2022
(Accepted for publication December 15, 2022)
DOI:10.7752/jpes.2022.12393

Abstract:
Athletes of all abilities, particularly elite athletes, are encouraged to use sports nutrition strategies that improve mental and physical performance while also supporting good health. These strategies include eating a well-balanced diet with enough energy to meet the macronutrient and micronutrient requirements of training and competition, maintaining optimal body mass (BM) and composition, and implementing specific nutritional strategies before, during, and after training to improve performance. Female athletes experience injuries compared to male athletes so there needs to be good and appropriate injury prevention management for female athletes. This research method is a literature review with several stages. Eligibility Criteria, Information sources and search, Study Selection, Data collection Process. From 125 publications 100 articles remained after the first selection, which was adjusted for duplicates. After screening the abstracts, 70 were excluded. The full texts of 230 articles were screened using eligibility criteria. Finally, 30 studies on female/women athletes subjects were accepted for the qualitative analysis. In the articles that have been observed, several types of supplements used by female athletes appear, supplements, including iron supplements, calcium, types of drinks that contain high protein, packaged drinks that contain high creatinine, caffeine, melatonine, vitamin D, New Zealand Blackcurrant, sodium phospate. Despite the fact that female athletes outnumber male athletes in certain sports, literature on nutrient consumption and, in particular, supplement intake in female athletes is lacking. Even though female athletes are one of the groups prone to malnutrition, it is necessary to manage food intake while properly monitoring how to take supplements so that conditions in which female athletes experience malnutrition do not occur.
Key Words*:* **Female, athletes, supplementation**

Introduction

Athletes of all abilities, particularly elite athletes, are encouraged to use sports nutrition strategies that improve mental and physical performance while also supporting good health. These strategies include eating a well-balanced diet with enough energy to meet the macronutrient and micronutrient requirements of training and competition, maintaining optimal body mass (BM) and composition, and implementing specific nutritional strategies before, during, and after training to improve performance.

Research conducted by Bakar in 2022 shows that often female athletes experience injuries compared to male athletes so there needs to be good and appropriate injury prevention management for female athletes (Bakar & Shaharudin, 2022)

On the other hand, Women's participation in competitive sports has increased in recent decades. This increase in participation has a positive impact on the world of sports by improving competition quality. However, it is becoming increasingly clear that high-intensity physical activity can have a negative impact on athletes' mental, social, and physiological health.

According to this, the majority of female athletes in Indonesia Supplement users are known not to have sufficient knowledge of supplement safety and benefits. Furthermore, young female athletes are a vulnerable group in terms of nutrition.

This is because they should need good nutrition during their adolescence to support the growth spurt, but young female athletes are also expected to perform optimally and achieve during competition (Aliyyan Wijaya & Riyadi, n.d.; Rosen et al., 2015)This research will identify the use of the supplement in female athletes so that it can be an alternative in the selection of the right supplement for female athletes

Corresponding Author: SEPTA KATMAWANTI, E-mail: septakatma.fik@um.ac.id

Material & methods

Eligibility Criteria

The PICOS strategy was defined as follows: "P" (participants) human subjects, "I" (interventions) oral LC treatment, "C" (comparisons) supplementation versus placebo, supplementation versus control, or pre- and post-supplementation, "O" (outcomes) muscle variables, and "S" (study design) randomized controlled trials, nonrandomized controlled trials, nonrandomized noncontrolled trials. Excluded studies met the following criteria: articles with no full-text availability, reviews, and case studies described in languages other than English Following that, the following eligibility criteria were applied: a) healthy human subjects; b) at least 12 weeks of supplementation; c) oral LC administration; d) no drug coingestion; e) no multi-ingredient supplementation

Information sources and search

The MEDLINE (via PubMed) and Web of Science databases were used to search the literature, which included all articles published from the beginning to February 2012. The terms "supplementation for women athletes" or "supplementation for female athletes" were searched for in conjunction with "exercise", "training", "athletic, and performance",

Study Selection

First, studies were evaluated using title verification between databases (duplicates were removed). The second assessment, conducted using abstracts, excluded studies in languages other than English, studies lacking full text, reviews, case reports, animal studies, and in-vitro studies. The final step was to analyze full manuscripts using the eligibility criteria described above.

Data collection Process

Each study's authors, year of publication, type of study, length of supplementation, dose of supplementation, and main effect were compiled. Finally, a thematic analysis was performed to synthesize and interpret all of the data that appeared in the included publications. Two authors (A.S., G.R.) worked independently on paper selection, data collection, and quality assessment, and all disagreements were resolved through discussion with the third author (R.O).

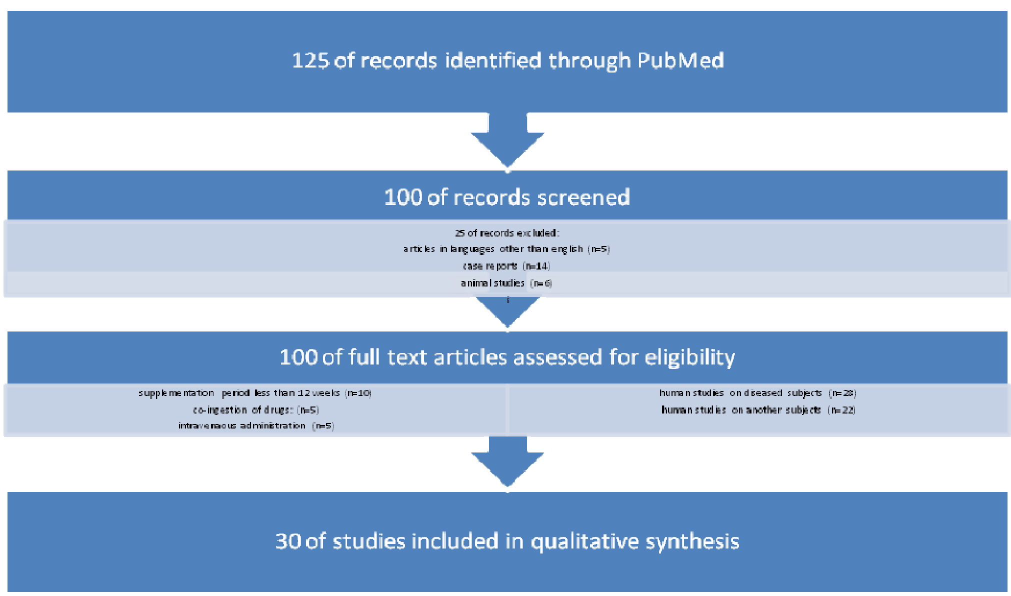

Figure 1. PRISMA flow diagram

Results

Study Selection

125 publications were found using the search strategy described above. 100 articles remained after the first selection, which was adjusted for duplicates. After screening the abstracts, 70 were excluded because they were in languages other than English, lacked full text, or were review articles, case reports, animal or in-vitro studies. The full texts of 230 articles were screened using eligibility criteria. Finally, 30 studies on female/women athletes subjects were accepted for the qualitative analysis, with LC administered orally for at least 12 weeks with no drugs or other multi-ingredient supplements coingestion (Fig. 1).

Identification carried out by the authors in 35 articles shows that several supplements were given to female athletes, namely, among others, vitamin and mineral supplements as well as supplements taken from natural products such as vegetables and fruit. The detailed explanation is shown as follows at table 1(Dieny, Fitranti, Jauharany, & Tsani, 2021; Larson-Meyer, Woolf, & Burke, 2018)

Table 1. Results of Literature

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
(Backx et al., 2016)	M (*n* : 54*)* and W (*n* : 48) , highly trained athletes	EC1: Vitamin D3	Take 400, 1100 or 2200 IU vitamin D3 per day orally for 1 year	Subjects were fasted for at least 3 h before blood samples were collected by venipuncture to assess serum total 25(OH) concentration. After collection, blood tubes were stored for at least 30 min in a dark box to allow clotting, after which they were centrifuged for 10 min at 1550 G. Serum was separated and stored at − 80 °C until analysis.	Nearly 70% of all athletes showed an insufficient (50–75 nmol/l) or a deficient (o50 nmol/l) 25(OH)D concentration at baseline. After 12 months, serum 25(OH)D concentration had increased more in the 2200 IU/day group (+50 ± 27 nmol/l) than the sufficient group receiving no supplements (+4 ± 17 nmol/l; Po0.01) and the 1100 IU/day group (+25 ± 23 nmol/l; Po0.05). Supplementation with 2200 IU/day vitamin D resulted in a sufficient 25(OH)D concentration in 80% of the athletes after 12 months.
(Kjølbæk et al., 2017)	Participants aged 18–60 y with body mass index (in kg/m2) from 27.6 to 40.4	EC1: whey and calcium EC2: whey EC3: soy EC4: maltodextrin	Participants consumed the following isocaloric supplements (45–48 g/d)	Body composition, blood biochemistry, and blood pressure were measured at baseline, before WM, and after WM (weeks 0, 8, and 32, respectively). Diet-induced thermogenesis (DIT) and appetite sensation were studied using meal tests. The 24-hour urinary nitrogen excretion was used to assess compliance.	Protein supplementation does not result in improved WM success, or blood biochemistry after WL compared with the effects of normal dietary protein intake (0.8–1.0 g $ kg21 $ d21).
(Clarke & Richardson, 2021)	M (*n*:27*)* and W (*n*:19*),* complete d a 5-km cycling time	EC1: Kafein	Participant following the ingestion of 0.09 g/kg coffee providing 3 mg/kg of caffeine, or a placebo	Completed a 5-km cycling time trial on a cycle ergometer 60 m in following the ingestion of 0.09 g/kg coffee providing 3 mg/kg of caffeine, or a placebog	habitual caffeine consumption did not affect the ergogenicity of coffee ingestion prior to a 5-km cycling time trial
(Kass & Poeira, 2015)	M (*n* : 7) W (*n* : 6) recreational running, cycling and triathlete clubs	EC1: magnesium EC2 : placebo	Magnesium citrate and placebo (cornflour) were capsulated into large vegetarian capsules. Capsules consisted of a total 300 mg/d elemental Mg2+	Supplements were ingested evenly throughout the day on a non-testing day, or ingested 3 hours before exercise testing	There was no cumulative effect of Chr supplementation compared to A.
(Gervasi et al., 2020)	M (*n* : 20) W (*n* : 12) healthy young adults	EC1:supplement (13.2 g of carbohydrates; 3.2 g of BCAA; and 1.6 g of L-alanine per dose) EC2:a placebo.	Before each test and training session, all subjects took the supplement (13.2 g of carbohydrates; 3.2 g of BCAA; and 1.6 g of L-alanine per dose) or a placebo.	To induce fatigue in the participants, a high-intensity endurance cycling (HIEC) test was used: HIEC consisted of ten 90-second sprints interspersed by ten 3-minute recovery phases, followed by a final step time to exhaustion.	When compared to the placebo (PL), the supplement (SU) at 1d reduced RPE by 9% during the recovery phase; at 9w, RPE scores were reduced by 13 and 21% during the sprint and recovery phases, respectively; and at 9w, prolonged supplement intake improved TTE and TRIMP.
(Hansen et al., 2020)	Healthy, trained runners (18–50 yrs.)	EC1: Carbohydrate EC2: Protein and Carbohydrate	The PRO-CHO group consumed a protein beverage (0.3 g kg- 1) before each exercise session and a protein-carbohydrate beverage (0.3 g protein kg- 1 and 1 g	Subjects were randomly assigned to either PRO-CHO or CHO and matched in pairs for gender, age, VO2max, training and performance status. The PROCHO group ingested a protein	Following six weeks of endurance training Cytochrome C (Cyt C) protein content was significantly higher in the PRO-CHO group compared to the CHO group ($p < 0.05$), with

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
			carbohydrate kg- 1) afterward.	beverage (0.3 g kg− 1) before and protein-carbohydrate beverage (0.3 g protein kg− 1 and 1 g carbohydrate kg− 1) after each exercise session. The CHO group ingested an energy matched carbohydrate beverage.	several other mitochondrial proteins (Succinate dehydrogenase (SDHA), Cytochrome C oxidase (COX-IV), Voltage-dependent anion channel (VDAC), Heat shock protein 60 (HSP60), and Prohibitin (PHB1)) following a similar, but non-significant pattern (p = 0.07–0.14).
(Alghannam, Tsintzas, Thompson, Bilzon, & Betts, 2014)	A total of 32 research participants will be recruited for each phase from the local community via public advertisement	EC1: whey protein hydrolysate + Sucrose EC 2: protein EC3: placebo	Immediately post-exercise, participants will be prescribed solutions providing 0.4 grams per kilogram of body mass (g · kg−1) of whey protein hydrolysate plus 0.4 g · kg−1 sucrose, relative to an isocaloric sucrose control (0.8 g · kg−1; Phase I). In Phase II, identical protein supplements will be provided (0.4 + 0.4 g · kg−1 · h−1 of whey protein hydrolysate and sucrose, respectively)	For each treatment, participants will be required to undergo six weeks of running-based endurance training.	By investigating the role of nutrition in enhancing the effects of endurance exercise training, we will provide novel insight regarding nutrient-exercise interactions and the potential to help and develop effective methods to maximize health or performance outcomes in response to regular exercise.
(Dean & Meghan, 2017)	34 runners	EC1: beetroot juice EC2: placebo	I adore beets and beetroot juice (Gs Fresh Ltd, Cambridgeshire, UK). Previous juice analysis revealed that each bottle contains 400 mg of phenolic compounds (expressed as Gallic acid equivalents) and 194 mg of the pigment, betanin (Clifford et al. 2016b).	Respondent consumed either BTJ or an isocaloric placebo (PLA) for 3 days following a marathon.	Beetroot juice did not attenuate inflammation or reduce muscle damage following a marathon, possibly because most of these indices were not markedly different from baseline values in the days after the marathon.
(Mielgo-Ayuso, Zourdos, Calleja-Gonzalez, Urdampilleta, & Ostojic, 2015)	Twenty-two volleyball players (aged 27.0 ± 5.6 years)	EC1|: iron supplementation EC2: placebo	Iron treatment group (ITG, n = 11), which received 325 mg/day of ferrous sulphate daily.	Subjects performed their team's regimen of training or match play every day.	During the competitive season, oral iron supplementation prevents iron loss and increases strength in female volleyball players.
(Farjallah et al., 2022)	professional soccer players [age: 17.5 ± 0.8 years	EC1: melatonin ingestion EC2: placebo	supplements in capsule with melatonin		The results of research indicate that MEL supplementation reduces lipid peroxidation, strengthens the defence mechanisms against oxidative stress and decreases muscle damage induced by a running exercise until exhaustion exercise. However, these protective effects have no significant effect on physical performance
(Jurado-Castro et al.,	women players	creatine supplement	Both group following a specific training as	circadian rhythms exert on sports	circadian rhythms may influence

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
2022)	of a handball (n=14) (7 consumed in morning, 7 consumed in evening)		long as twelve week	performance	performance, these appear not to affect creatine supplementation, as creatine is stored intramuscularlyand is available for those moments of high energy demand, regardless of the time of day
(Buck, Guelfi, Dawson, McNaughton, & Wallman, 2015)	Female (n=12)	(1) sodium phosphate and caffeine (2) sodium phosphate and placebo (for caffeine) (3) caffeine and placebo (for sodium phosphate) (4) placebo (for sodium phosphate and caffeine)	21 days separating each trial. After each trial, participants performed a simulated team-game circuit (4 × 15 min quarters) with 6 × 20-m repeated-sprints performed once before (Set 1), at halftime (Set 2), and after end (Set 3)	Participants completed a simulated team-game circuit (4 15-minute quarters) with six 20-meter repeated sprints performed once before (Set 1), once at half-time (Set 2), and once at the end (Set 3). (Set 3)	All results are presented as mean ± s. Ambient temperature in the gym during the trials was 21 ± 4°C, while relative humidity was 62 ± 5% with these values being similar between trials (P = 0.721; P = 0.423, respectively). Furthermore, the average completion times for the 15 laps of each quarter were not different between trials (P = 0.071) and within trials (P = 0.671).
(Koivisto et al., 2018)	31 national team endurance athlete	EC1: antioxidant-rich foods EC2: eucaloric control foods	ntioxidant-rich foods (n = 16) or eucaloric control foods (n = 15) daily during a 3-week altitude training camp (2320 m).	Changes in hemoglobin mass (Hbmass; optimized CO rebreathing), maximal oxygen uptake (VO2max; n = 16), or 100 m swimming performance (n = 10) were compared between groups, as were blood parameters.	The antioxidant group significantly increased total intake of antioxidant-rich foods (~118%) compared to the control group during the intervention.
(Arnarson et al., 2013)	M (*n* : 67) W (*n* : 94)	EC1: Protein drink EC 2: Car bohydrate drink	The whey protein drink was based on sweet whey concentrate and contained 20 g protein, 20 g carbohydrates and 1 g fat per portion (250 ml, 169 kcal), whereas the carbohydrate drink contained 40 g carbohydrates and 1 g fat per portion (250 ml, 169 kcal).	Subjects exercised for three non-consecutive days per week for 12 weeks in groups of 20–30 individuals. The first week was used to teach correct exercise techniques at lower loads (60% of one-repetition maximum). Thereafter, resistance training involved three sets, where each exercise was repeated 6–8 times, at 75–80% of one-repetition maximum. The training load was systematically increased by 5–10% each week in order to keep the number of repetitions per set between six and eight.	Ingestion of 20 g of whey protein immediately after resistance exercise three times per week, does not lead to greater gains in lean body mass, strength and physical function in elderly people with sufficient energy and protein intakes when compared to isocaloric carbohydrate
(Hansen, Bangsbo, Jensen, Bibby, & Madsen, 2015)	18 elite orienteers in Denmark above 18 years of age who were at a national or international level were invited to	EC1 : PRO-CHO	PRO-CHO ingested 0.3 g protein kg-1	The postexercise drink was ingested within the first 15 min after each exercise session and nothing else was ingested until two hours after each training session except water.	The results indicate that protein supplementation in conjunction with each exercise session facilitates the recovery from strenuous training in elite orienteers

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
	the training camp				
(Mana et al., 2017)	active female (n=24)	EC1: caffeine EC2: placebo	Caffeine and starch were handled in a pharmacy in capsules containing 50 milligrams.	the effect of exercise (week 1 x 2) and caffeine intake (GC x GP) on thiobarbituric acid (TBARS), interleukin 6 (IL-6), interleukin 10 (IL-10) and superoxide dismutase (SOD) variables during pre-exercise time (30 min. after caffeine or placebo intake) and post-exercise (5 min after treadmill test).	The increased IL-6 suggest that this ergogenic supplement may stimulate muscle hypertrophy, since IL-6 has myokine effect. However, the caffeine effect on IL-6 level and muscle hypertrophy increase should be better investigated in future studies
(Berends et al., 2019)	Female (n=16)	EC1 : beetroot juice	29 healthy recreationally active volunteers ingested BRJ with or without additional vitamin C Supplements for one week		A significant increase of urinary apparent total N-nitroso Compounds (ATNC) was found after one dose (5 to 47 nmol/mmol: $p < 0.0001$) and a further increase was found after seven consecutive doses of BRJ (104 nmol/mmol: $p < 0.0001$). Vitamin C supplementation inhibited ATNC increase after one dose (16 compared to 72 nmol/mmol, $p < 0.01$), but not after seven daily doses.
(Murillo et al., 2015)		EC 1 : Protein Suplement	exercise session (CP = +0.94 g/kg/day protein during ICT; +0.39 g/kg/day during RVT)	In a crossover design, subjects consumed supplemental carbohydrate (CHO) or an equal amount of carbohydrate with added protein (CP)	CP supplementation impacted skeletal muscle and heart rate responses during a period of heavy training and recovery, but this did not result in meaningful changes in time trial performance.
(D'Lugos et al., 2016)	Female (n=96)	EC1: no intervention control group (CON); EC2: 2 weeks of aerobic and resistance training only (EX) EC3: exercise routine combined with dietary counseling in accordance with German Nutrition Society guidelines (EXDC) EC4: exercise routine combined with intake of 2 g/day oil from Calanus finmarchicus (EXDC).	The CON group served as the control group, and participants in this group were asked to stick to their usual diet and level of physical activity for the duration of the 12-week study.	Exercise training was required twice a week for the EX, EXDC, and EXCO groups. Participants assigned to the EX group were instructed to continue eating their normal diet. Participants assigned to the EXDC group were asked to modify their diet in accordance with the German Nutrition Society's dietary guidelines.	results of this pilot study suggest that a combination of moderate exercise and intake of oil from Calanus finmarchicus or a healthy diet may promote fat loss in elderly untrained overweight participants
(Ruder, Hartman, Reindollar, & Goldman, 2014)	Female (n=31)	EC1: ready to drink pre workout beverage EC2: placebo	Participants were randomly assigned to either a placebo (PLA) beverage with 6.0 g dextrose and non-caloric sweetener or a beverage (RTD) with caffeine anhydrous (200 mg), -alanine (2.1 g), niacin (65 mg), folic acid (325 mcg), Vitamin B12 (45 mcg), and arginine nitrate (1.3 g providing about 350	Anthropometry & Body Composition, Blood Collection Procedures, Blood Chemistry, Hemodynamic Challenge Test, Self-Reported Side Effects etc	No significant differences were observed between treatments in cycling TT performance, hemodynamic assessment, fasting blood panels, or self-reported side effects

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
			mg of nitrates and 950 mg of arginine)		
(Wasserfurth et al., 2020)	Female (n=77)	EC1: flavonoid supplementation EC2: placebo	A 45-minute walking bout (62.2 0.9% VO2max (maximal oxygen consumption rate)) combined with two weeks of flavonoid supplementation (329 mg/day, quercetin, anthocyanins, flavan-3-ols mixture) enhanced the translocation of gut-derived phenolics into circulation in a group of walkers.	The walkers (flavonoid and placebo groups) were randomly assigned to either sit or walk briskly on treadmills for 45 minutes (resulting in four groups: placebosit, placebowalk, flavonoidsit, flavonoidwalk). A control group of 19 runners took a double flavonoid dose (658 mg/day) for two weeks and ran for 2.5 hours (69.2 1.2% VO2max).	These data indicate that acute exercise bouts (brisk walking, intensive running) are linked to an increased translocation of gut-derived phenolics into circulation, an effect that is amplified when combined with a two-week period of increased flavonoid intake or chronic training as a runner.
(Collins et al., 2017)	Female (n=14)	EC1: caffeine EC2: placebo	A double-blind placebo-controlled cross-over design with four experimental trials was used; placebo (4-day) -acute placebo/PP, placebo (4-day) -acute caffeine/PC, caffeine (4-day) -acute caffeine/CC and caffeine (4-day) - acute placebo/CP	For four days, fourteen recreationally trained female cyclists took either placebo or caffeine (6 mgkg-1) capsules. On day 5 (acute), placebo or caffeine (6 mgkg-1) capsules were taken 60 minutes before a 16 km time trial (TT). When compared to the CP and PP conditions, CC and PC improved in time (3.54%, ES = 0.72; 2.53%, ES = 0.51) and output power (2.85%, ES = 0.25; 2.53%, ES = 0.20) (p 0.05).	these results indicate that caffeine, when ingested by cyclists in a dose of 6 mg_kg□1 for 4 days, does not induce tolerance to the ergogenic e_ects promoted by acute intake on physiological, metabolic, and performance parameters
(Domínguez et al., 2017)	Female (n=43)	EC1: Lp299v with iron EC2: placebo	The Lp299v product (LpFe) contained freeze-dried probiotic Lactobacillus plantarum 299v at a concentration of 1010 CFU/capsule, 20 mg of iron (ferrous-fumarate), maize starch (bulking agent), maltodextrin (bulking agent), cellulose derivatives (coating of iron), and magnesium stearate (processing aid/anti-caking)	In meal studies, the probiotic strain Lactobacillus plantarum 299v (Lp299v) significantly increases intestinal iron absorption. The current study sought to investigate the effects of 20 mg of iron with or without Lp299v on iron status, mood, and physical performance.	No conclusive e_ects on physical performance were observed. In conclusion, Lp299v, together with 20 mg of iron, could result in a more substantial and rapid improvement in iron status and improved vigor compared to 20 mg of iron alone
(Nieman et al., 2018)	Female athletes (n=32)	EC1: Soy protein intake EC2: placebo	They were told to do 5 sets of fast and slow walking for 3 minutes each at 70 and 40% peak aerobic capacity for walking, respectively, four days a week.	The researchers wanted to see if eating dried tofu during a 5-month interval walking training (IWT) program increased thigh muscle mass and strength and reduced susceptibility to inflammation in older women. This study included subjects (n = 32, 65 years old) who had been doing IWT for more than 6 months.	dried tofu supplementation during IWT likely enhanced the methylation of the *NFKB2* gene more than IWT alone, without detectably enhanced increases in thigh muscle strength or cross-sectional area.
(Morales, Sampaio-Jorge, Barth, Pierucci, & Ribeiro, 2020)	Female runners (n=100)	EC1: PRO consumed 30 min post-RE EC2: placebo	Participants were given milk protein or carbohydrate supplements for three days after the race.	The average protein intake was determined using 24-hour recalls. At baseline and 1-3 days after the race, race characteristics were determined, and muscle soreness was assessed using the Brief Pain Inventory.	Post-exercise protein supplementation is not more preferable than carbohydrate supplementation to reduce muscle soreness or other damage markers in recreational athletes with mostly a sufficient baseline protein intake running a 15-km

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
					road race.
(Axling et al., 2020)	Female athletes= 18	EC1: PRO consumed 30 min post-RE EC2: placebo	3 mg/kg of p-synephrine	The exercise trials included a ramp test on a cycle ergometer (from 30 to 80% of maximal oxygen uptake; VO2max), while substrate oxidation rates were measured at each workload using indirect calorimetry.	that the increase in resting tympanic temperature induced by p-synephrine hindered the effect of this substance on fat utilization during exercise in healthy active women.
(Wasserfurth et al., 2020)	Female athletes= 30	EC1: daytime PRO consumed 30 min post-RE EC2: placebo	1) daytime PRO consumed 30 min post-RE and presleep placebo (PLA) consumed 30 min before bed (PRO-PLA); and 2) daytime PLA consumed 30 min post-RE and presleep PRO consumed 30 min 2 Allman et al. Downloaded from https://academic.oup.com/jn/advance-article-abstract/doi/10.1093/jn/nxz186/5555589 by University of Cincinnati user on 18 November 2019 before bed (PLA-PRO	For Visit 1, participants completed all relevant paperwork and were familiarized with the 1-repetition maximum (1RM) testing of the barbell squat and bench press exercises, which has been described in another study from our laboratory	There was no difference between the effects of daytime and presleep PRO supplementation on SCAAT lipolysis or whole-body substrate utilization in resistance-trained women. Presleep PRO is a viable option for increasing PRO consumption in resistance-trained women because it does not blunt overnight lipolysis, and will therefore likely not lead to increases in subcutaneous abdominal fat
(Morikawa et al., 2018)	Female(n =8)	EC1: whey PRO hydrolysate and ALA supplementation EC2: placebo	The treatments were: 1) PRO: 45 g·L–1 of whey protein hydrolysate (American Casein Company, Burlington, NJ, USA), 2) ALA: 15 g·L–1 of L-alanine (Ajinomoto North America, Fort Lee, NJ, USA), and 3) PLA: noncaloric artificially sweetened placebo	Oxygen uptake (VO2), expired ventilation (VE) and respiratory exchange ratio (RER) were assessed using a Moxus Modular Metabolic System (AEI Technologies, Pittsburgh, PA, USA) or a VMAX Sensormedics Spectra (Yorba Linda, CA, USA) metabolic cart at the following time points: 15–20 min and 115–120 min of constantload cycling, and at 20-km of the TT	ALA intake appears to lower HR and PRO ingestion dampens the IL-6 response to exercise, the ingestion of PRO (without CHO) or ALA does not enhance, and may actually impair, performance following prolonged cycling
(Ten Haaf et al., 2021)	Female (n=12)	EC1: Microencapsulated caffeine EC2: placebo	Microencapsulated caffeine (6 mg/kg body weight) was supplemented 60 min pretrial	Capillary blood lactate concentrations were assessed prerace, during transitions, and 3, 6, 9, 12, and 15 min after triathlons. Caffeine supplementation resulted in a 3.7% reduction in swim time (33.5 ± 7.0 vs. 34.8 ± 8.1 min, $p < .05$) and a 1.3% reduction in time to completion (149.6 ± 19.8 vs. 151.5 ± 18.6 min, $p < .05$) for the whole group	triathlon athletes, particularly those with low habitual caffeine intake, may improve performance by ingesting 6 mg/kg body mass of caffeine, 45-60 minutes before the start of a race.
(Gutiérrez-Hellín et al., 2022)	Female (n=8)	EC1: Vitamin D3 supplement (D3) EC2: placebo	EC1: 4000 IU	vertical jump test to assess peak power output	Modest Vitamin D3 supplementation did not elicit statistically significant or meaningful changes in body composition or performance (peak power) over placebo supplementation, in our cohort of collegiate basketball players. However, on an individual basis, players with the

Reference	Participants	Experimental Condition	Supplementation Protocol	Variables	Results
					lowest 25(OH)D demonstrate the highest increases in 25(OH)D after modest supplementation
(Allman et al., 2020)	Female (n=5/groups)	EC1:rich nitrate salad mixed citrulline EC2: placebo	CE1: soy protein, skimmed milk powder, and honey without additives. The protein content of this product is 53.3% (83% soy-protein-isolate, and 17% milk protein).	Reguler endurance training	protein intake of _20% of total energy intake led to a lower-level stress reaction after the marathon race. In conclusion, supplementary protein intake may influence exercise-induced muscle stress reactions by changing cellular metabolism and inflammatory pathways.
(Schroer, Saunders, Baur, Womack, & Luden, 2014)	Female athletes (n=12)	EC1: rich nitrate salad mixed citrulline EC2: placebo	CE1: N + C, 520 mg nitrate and 6 g citrulline	incremental cycling	These results suggest that chronic nitrate and citrulline supplementation enhances the effect of exercise training on quadricepsmuscle function in healthy active young individuals, but this does not translate into improvedmaximal aerobic performances

Dicussion

In the articles that have been observed, several types of supplements used by female athletes appear, supplements, including iron supplements, calcium, types of drinks that contain high protein, packaged drinks that contain high creatinine, caffeine, melatonine, vitamin D, New Zealand Blackcurrant, sodium phospate. The following is the explanation:

Iron

There is no consensus recommendation for iron supplementation dosage, frequency, delivery method, or duration in IDNA athletes. All of these variables differed significantly across the review studies. The most common iron supplement used in the studies reviewed was ferrous sulfate (20% elemental iron [the percentage absorbed by the gastrointestinal tract]). A typical recommended treatment for IDA is 375 mg of ferrous sulfate twice daily, for a total of 150 mg of elemental iron. For reference, the recommended daily allowance of elemental iron for women (aged 19-50 years) is 18 mg per day, while men are only recommended 8 mg per day (Pedlar, Brugnara, Bruinvels, & Burden, 2018)

Calcium

The binding of calcium to troponin C is fundamental to muscle contraction, and therefore theoretically has an impact on performance. Certainly, calcium losses increase during exercise, largely through sweat, and such losses have been ameliorated by calcium supplementation of 800 mg day albeit in the presence of a low calcium diet. However, there is no evidence of calcium supplementation having a direct effect on athletic performance (Beck, von Hurst, O'Brien, & Badenhorst, 2021). Despite the fact that Ca is critical for muscle and cardiovascular function, Currently, there is no evidence that Ca supplementation has any direct effect on athletic performance for female athletes (only aerobic capacity has been studied). Nonetheless, calcium supplementation at oral doses ranging from 800 mg (over 8 days) to 1352 mg (single meal prior to exercise) or IV infusion at 156 mg (prior to and during exercise) may reduce post-exercise reductions in serum iCa and Ca loss, with lower doses having no effect

Despite the fact that Ca is critical for muscle and cardiovascular function, Currently, there is no evidence that Ca supplementation has any direct effect on athletic performance for female athletes (only aerobic capacity has been studied). Nonetheless, calcium supplementation at oral doses ranging from 800 mg (over 8 days) to 1352 mg (single meal prior to exercise) or IV infusion at 156 mg (prior to and during exercise) may reduce post-exercise reductions in serum Ca and Ca loss, with lower doses having no effect

Creatine

Creatine supplementation increases lean body mass as well as strength, power, and efficacy in short-duration, high-intensity exercises. The increases in body mass were thought to be the result of increased intracellular water related to fluid shifts due to the osmotic properties of creatine. However, taking creatine in conjunction with a resistance training program yielded greater increases in body mass (Butts, Jacobs, & Silvis, 2018; Cavalcante et al., 2022; Tokatlidou, Xirouchaki, Kostopoulos, & Armenis, 2021).

Protein

Protein intake should be optimized in all athletes in order to maximize the efficiency of the skeletal muscle adaptive response to exercise training. The majority of studies evaluating the need for dietary protein have been conducted in men, with the majority of them involving resistance exercise training. Protein requirements in Female Athletes have primarily been studied using nitrogen balance methodology or by measuring muscle mass gains or losses during dietary interventions. If muscle mass accretion with resistance training is the goal, on some of our manuscripts on protein intake in female athletes found that protein intake of up to 1.6 g protein kg1 BW day1 was beneficial. sufficient to boost resistance training-induced gains in FFM by 27% on average in female athletes

Protein has muscle building and repair has made it an obvious focus of attention by athletes and coaches. Daily requirements for protein are increased due to a regular commitment to exercise and to support the synthesis of new proteins that accompanies the adaptive response to each workout or event. Indeed, the protein targets for athletes in heavy training are in the range of 1.2-1.6 g/kg body mass daily1 , which is up to double the amount recommended for sedentary populations. The highest recommendations for protein (1.6-2.4 g/kg body mass daily) are targeted to athletes who are undertaking weight loss programs. Such athletes usually desire to achieve “high quality weight loss” in which they reduce fat mass but retain muscle mass (AIS, 2021)

Caffeine

Caffeine is widely accepted as an endurance-performance enhancing supplement. The benefits of caffeine supplementation for endurance performance have been well-established. Most scientific research studies use doses of 3–6 mg/kg of caffeine 60 min prior to exercise based on pharmacokinetics (Kreutzer, Graybeal, Moss, Braun-Trocchio, & Shah, 2022). Caffeine, when consumed in a dose of 6 mgkg1 for 4 days by cyclists, does not induce tolerance to the ergogenic effects promoted by acute intake on physiological, metabolic, and performance parameters. Furthermore, when compared to the CP and PP conditions, CC and PC improved in both time and output power. In both the withdrawal and 4-day supplementation conditions, physiological and metabolic responses such as an increase in heart rate, minute volume, expired O_2 fraction, blood lactate concentration (T2 and Recovery), and a decrease in expired CO_2 fraction were similar (Morales et al., 2020)

Melatonine

Recent findings indicate ingestion of melatonin prior to exercise enhances tolerance to training and improves competition. Apparently, the high concentrations of melatonin in the body at the time of physical activity can cause a decrease in sports performance, mainly due to the fact that this hormone has depressant effects on the sympathetic nervous system (López-Flores, Luque-Nieto, Costa Moreira, Suárez-Iglesias, & Villa-Vicente, 2018)

Vitamin D

a prolonged lack of vitamin D (25(OH)D) can lead to stress fractures in athletes since 25(OH)D insufficiency is associated with an increased incidence of a fracture. Stress fractures are not uncommon in athletes and affect around 20% of all competitors. Most athletes with a stress fracture are under 25 years of ageb(Chiang, Ismaeel, Griffis, & Weems, 2017; Knechtle, Jastrzębski, Hill, & Nikolaidis, 2021) additionally, another research showed that after controlling for body composition, smoking, and season, a prospective cohort study of 967 young, healthy men and women found that vitamin D status predicted endurance exercise performance but not strength or power. In a randomized placebo-controlled trial, safe simulated summer sunlight or oral vitamin D3 were effective in almost all participants in achieving clinically important vitamin D sufficiency. However, supplementing with vitamin D did not improve exercise performance, implying that vitamin D does not directly affect exercise performance (Carswell et al., 2018; Chiang et al., 2017).

New Zealand blackcurrant

Blackcurrant has a small, but significant, effect on sport performance, with no known detrimental side effects. There was an improvement in sport performance when supplementing with blackcurrant, 0.45 (95% CI 0.09–0.81, $p = 0.01$). The effective dose appears to be between 105 and 210 mg of total blackcurrant anthocyanins, prior to exercise (Braakhuis, Somerville, & Hurst, 2020)

Sodium phosphate

One emerging nutritional supplement that has shown some positive benefits for sporting performance is sodium phosphate. For ergogenic purposes, sodium phosphate is supplemented orally in capsule form, at a dose of 3–5 g/day for a period of between 3 and 6 days. A number of exercise performance-enhancing alterations have been reported to occur with sodium phosphate supplementation, which include an increased aerobic capacity, increased peak power output, increased anaerobic threshold and improved myocardial and cardiovascular responses to exercise (Buck et al., 2015)

Conclusions

Despite the fact that female athletes outnumber male athletes in certain sports, literature on nutrient consumption and, in particular, supplement intake in female athletes is lacking. Even though female athletes are

one of the groups prone to malnutrition, it is necessary to manage food intake while properly monitoring how to take supplements so that conditions in which female athletes experience malnutrition do not occur.
As any athletic population chooses to take supplements to improve performance (as evidenced by the studies discussed above), female athletes should be aware of the potential risks of supplementation and be familiar with anti-doping regulations specific to their sport.

Conflicts of interest
The author declares no potential conflict of interest.

References:
AIS. (2021). *AIS Sports Supplement Framework* (hal. 1–4). hal. 1–4. The AIS Sports Supplement Framework.
Alghannam, A. F., Tsintzas, K., Thompson, D., Bilzon, J., & Betts, J. A. (2014). Post-Exercise Protein Trial: Interactions between Diet and Exercise (PEPTIDE): Study protocol for randomized controlled trial. *Trials*, *15*(1), 1–12. https://doi.org/10.1186/1745-6215-15-459
Aliyyan Wijaya, M. Q., & Riyadi, H. (n.d.). KONSUMSI SUPLEMEN ATLET REMAJA DI SMA RAGUNAN JAKARTA (Food supplement consumption among adolescent athletes at Ragunan High School Jakarta). *Maret*, *10*(1), 41–48.
Allman, B. R., Morrissey, M. C., Kim, J. S., Panton, L. B., Contreras, R. J., Hickner, R. C., & Ormsbee, M. J. (2020). Lipolysis and Fat Oxidation Are Not Altered with Presleep Compared with Daytime Casein Protein Intake in Resistance-Trained Women. *Journal of Nutrition*, *150*(1), 47–54. https://doi.org/10.1093/jn/nxz186
Arnarson, A., Gudny Geirsdottir, O., Ramel, A., Briem, K., Jonsson, P. V., & Thorsdottir, I. (2013). Effects of whey proteins and carbohydrates on the efficacy of resistance training in elderly people: Double blind, randomised controlled trial. *European Journal of Clinical Nutrition*, *67*(8), 821–826. https://doi.org/10.1038/ejcn.2013.40
Axling, U., Önning, G., Combs, M. A., Bogale, A., Högström, M., & Svensson, M. (2020). The effect of lactobacillus plantarum 299v on iron status and physical performance in female iron-deficient athletes: A randomized controlled trial. *Nutrients*, *12*(5), 1–14. https://doi.org/10.3390/nu12051279
Backx, E. M. P., Tieland, M., Maase, K., Kies, A. K., Mensink, M., Van Loon, L. J. C., & De Groot, L. C. P. G. M. (2016). The impact of 1-year Vitamin D supplementation on Vitamin D status in athletes: A dose-response study. *European Journal of Clinical Nutrition*, *70*(9), 1009–1014. https://doi.org/10.1038/ejcn.2016.133
Bakar, N. A., & Shaharudin, M. S. D. M. (2022). The prevalence of knowledge on sports injury prevention and management among UiTM female athletes. *Journal of Physical Education and Sport*, *22*(11), 2669–2675. https://doi.org/10.7752/jpes.2022.11339
Beck, K. L., von Hurst, P. R., O'Brien, W. J., & Badenhorst, C. E. (2021). Micronutrients and athletic performance: A review. *Food and Chemical Toxicology*, *158*, 112618.
Berends, J. E., Van Den Berg, L. M. M., Guggeis, M. A., Henckens, N. F. T., Hossein, I. J., De Joode, M. E. J. R., … Van Breda, S. G. J. (2019). Consumption of nitrate-rich beetroot juice with or without vitamin C supplementation increases the excretion of urinary nitrate, nitrite, and N-nitroso compounds in humans. *International Journal of Molecular Sciences*, *20*(9), 1–15. https://doi.org/10.3390/ijms20092277
Braakhuis, A. J., Somerville, V. X., & Hurst, R. D. (2020). The effect of New Zealand blackcurrant on sport performance and related biomarkers: A systematic review and meta-analysis. *Journal of the International Society of Sports Nutrition*, *17*(1), 25.
Buck, C., Guelfi, K., Dawson, B., McNaughton, L., & Wallman, K. (2015). Effects of sodium phosphate and caffeine loading on repeated-sprint ability. *Journal of Sports Sciences*, *33*(19), 1971–1979. https://doi.org/10.1080/02640414.2015.1025235
Butts, J., Jacobs, B., & Silvis, M. (2018). Creatine use in sports. *Sports health*, *10*(1), 31–34.
Carswell, A. T., Oliver, S. J., Wentz, L. M., Kashi, D. S., Roberts, R., Tang, J. C. Y., … Rhodes, L. E. (2018). Influence of vitamin D supplementation by sunlight or oral D3 on exercise performance. *Medicine and science in sports and exercise*, *50*(12), 2555.
Cavalcante, J. B., Valentim-Silva, J. R., DE FREITAS, R. E., Dos Santos, K. M., DA COSTA, R. S. L., Cavalcante, R. C. D. S., … Silva, R. P. M. (2022). Courbaril extract (hymenaea courbaril l.) improve the explosive strength more than monohydrate creatine and decreases the muscle damage. *Journal of Physical Education and Sport*, *22*(5), 1234–1245. https://doi.org/10.7752/jpes.2022.05155
Chiang, C., Ismaeel, A., Griffis, R. B., & Weems, S. (2017). Effects of vitamin D supplementation on muscle strength in athletes: a systematic review. *The Journal of Strength & Conditioning Research*, *31*(2), 566–574.
Clarke, N. D., & Richardson, D. L. (2021). Habitual caffeine consumption does not affect the ergogenicity of coffee ingestion during a 5 km cycling time trial. *International Journal of Sport Nutrition and Exercise Metabolism*, *31*(1), 13–20. https://doi.org/10.1123/IJSNEM.2020-0204

Collins, P. B., Earnest, C. P., Dalton, R. L., Sowinski, R. J., Grubic, T. J., Favot, C. J., … Kreider, R. B. (2017). Short-term effects of a ready-to-drink pre-workout beverage on exercise performance and recovery. *Nutrients*, *9*(8), 1–19. https://doi.org/10.3390/nu9080823

D'Lugos, A. C., Luden, N. D., Faller, J. M., Akers, J. D., McKenzie, A. I., & Saunders, M. J. (2016). Supplemental protein during heavy cycling training and recovery impacts skeletal muscle and heart rate responses but not performance. *Nutrients*, *8*(9). https://doi.org/10.3390/nu8090550

Dean, M., & Meghan, A. (2017). Liam and Horsburgh , Steven and Keane , Karen M and Stevenson , Emma J and Howatson , Glyn (2017) Minimal muscle damage after a marathon and no influence of beetroot juice on inflammation and recovery . Applied Physiology , Nutrition and Metabolism , 42. *Applied Physiology, Nutrition, and Metabolism*.

Dieny, F. F., Fitranti, D. Y., Jauharany, F. F., & Tsani, A. F. A. (2021). POTENSI FEMALE ATHLETE TRIAD PADA ATLET REMAJA PUTRI DEFISIENSI BESI. *GIZI INDONESIA*, *44*(1), 1–10. https://doi.org/10.36457/gizindo.v44i1.511

Domínguez, R., Garnacho-Castaño, M. V., Cuenca, E., García-Fernández, P., Muñoz-González, A., de Jesús, F., … Maté-Muñoz, J. L. (2017). Effects of beetroot juice supplementation on a 30-s high-intensity inertial cycle ergometer test. *Nutrients*, *9*(12). https://doi.org/10.3390/nu9121360

Farjallah, M. A., Graja, A., Mahmoud, L. Ben, Ghattassi, K., Boudaya, M., Driss, T., … Hammouda, O. (2022). Effects of melatonin ingestion on physical performance and biochemical responses following exhaustive running exercise in soccer players. *Biology of Sport*, *39*(2), 473–479. https://doi.org/10.5114/BIOLSPORT.2022.106385

Gervasi, M., Sisti, D., Amatori, S., Donati Zeppa, S., Annibalini, G., Piccoli, G., … Sestili, P. (2020). Effects of a commercially available branched-chain amino acid-alanine-carbohydrate-based sports supplement on perceived exertion and performance in high intensity endurance cycling tests. *Journal of the International Society of Sports Nutrition*, *17*(1), 1–16. https://doi.org/10.1186/s12970-020-0337-0

Gutiérrez-Hellín, J., Aguilar-Navarro, M., Ruiz-Moreno, C., Muñoz, A., Amaro-Gahete, F. J., Posada-Ayala, M., … Varillas-Delgado, D. (2022). Effect of p-Synephrine on Fat Oxidation Rate during Exercise of Increasing Intensity in Healthy Active Women. *Nutrients*, *14*(20). https://doi.org/10.3390/nu14204352

Hansen, M., Bangsbo, J., Jensen, J., Bibby, B. M., & Madsen, K. (2015). Effect of whey protein hydrolysate on performance and recovery of top-class orienteering runners. *International Journal of Sport Nutrition and Exercise Metabolism*, *25*(2), 97–109. https://doi.org/10.1123/ijsnem.2014-0083

Hansen, M., Oxfeldt, M., Larsen, A. E., Thomsen, L. S., Rokkedal-Lausch, T., Christensen, B., … Madsen, K. (2020). Supplement with whey protein hydrolysate in contrast to carbohydrate supports mitochondrial adaptations in trained runners. *Journal of the International Society of Sports Nutrition*, *17*(1), 1–13. https://doi.org/10.1186/s12970-020-00376-3

Jurado-Castro, J. M., Campos-Pérez, J., Vilches-Redondo, M. Á., Mata, F., Navarrete-Pérez, A., & Ranchal-Sanchez, A. (2022). Morning versus evening intake of creatine in elite female handball players. *International Journal of Environmental Research and Public Health*, *19*(1). https://doi.org/10.3390/ijerph19010393

Kass, L. S., & Poeira, F. (2015). The effect of acute vs chronic magnesium supplementation on exercise and recovery on resistance exercise, blood pressure and total peripheral resistance on normotensive adults. *Journal of the International Society of Sports Nutrition*, *12*(1), 1–8. https://doi.org/10.1186/s12970-015-0081-z

Kjølbæk, L., Sørensen, L. B., Søndertoft, N. B., Rasmussen, C. K., Lorenzen, J. K., Serena, A., … Larsen, L. H. (2017). Protein supplements after weight loss do not improve weight maintenance compared with recommended dietary protein intake despite beneficial effects on appetite sensation and energy expenditure: A randomized, controlled, double-blinded trial. *American Journal of Clinical Nutrition*, *106*(2), 684–697. https://doi.org/10.3945/ajcn.115129528

Knechtle, B., Jastrzębski, Z., Hill, L., & Nikolaidis, P. T. (2021). Vitamin D and Stress Fractures in Sport: Preventive and Therapeutic Measures—A Narrative Review. *Medicina*, *57*(3), 223.

Koivisto, A. E., Paulsen, G., Paur, I., Garthe, I., Tønnessen, E., Raastad, T., … Bøhn, S. K. (2018). Antioxidant-rich foods and response to altitude training: A randomized controlled trial in elite endurance athletes. *Scandinavian Journal of Medicine and Science in Sports*, *28*(9), 1982–1995. https://doi.org/10.1111/sms.13212

Kreutzer, A., Graybeal, A. J., Moss, K., Braun-Trocchio, R., & Shah, M. (2022). Caffeine Supplementation Strategies Among Endurance Athletes. *Frontiers in Sports and Active Living*, 133.

Larson-Meyer, D. E., Woolf, K., & Burke, L. (2018, Maret). Assessment of nutrient status in athletes and the need for supplementation. *International Journal of Sport Nutrition and Exercise Metabolism*, Vol. 28, hal. 139–158. Human Kinetics Publishers Inc. https://doi.org/10.1123/ijsnem.2017-0338

López-Flores, M., Luque-Nieto, R., Costa Moreira, O., Suárez-Iglesias, D., & Villa-Vicente, J. G. (2018). Effects of melatonin on sports performance: A systematic review. *Journal of Exercise Physiology Online*, *21*(5).

Mana, V. M., Fett, C. A., Salicio, M. A., Brandão, C. F. C. C. M., Stoppiglia, L. F., Fett, W. C. R., & Botelho, C. (2017). The effect of caffeine supplementation on trained individuals subjected to maximal treadmill test. *African Journal of Traditional, Complementary and Alternative Medicines*, *14*(1), 16–23. https://doi.org/10.21010/ajtcam.v14i1.3

Mielgo-Ayuso, J., Zourdos, M. C., Calleja-Gonzalez, J., Urdampilleta, A., & Ostojic, S. (2015). Iron supplementation prevents a decline in iron stores and enhances strength performance in elite female volleyball players during the competitive season. *Applied Physiology, Nutrition and Metabolism*, *40*(6), 615–622. https://doi.org/10.1139/apnm-2014-0500

Morales, A. P., Sampaio-Jorge, F., Barth, T., Pierucci, A. P. T. R., & Ribeiro, B. G. (2020). Caffeine supplementation for 4 days does not induce tolerance to the ergogenic effects promoted by acute intake on physiological, metabolic, and performance parameters of cyclists: A randomized, double-blind, crossover, placebo-controlled study. *Nutrients*, *12*(7), 1–12. https://doi.org/10.3390/nu12072101

Morikawa, M., Nakano, S., Mitsui, N., Murasawa, H., Masuki, S., & Nose, H. (2018). Effects of dried tofu supplementation during interval walking training on the methylation of the NFKB2 gene in the whole blood of older women. *Journal of Physiological Sciences*, *68*(6), 749–757. https://doi.org/10.1007/s12576-017-0589-x

Murillo, S., Brugnara, L., Del Campo, E., Yagüe, I., Dueñas, B., & Novials, A. (2015). Carbohydrate Management in Athletes with Type 1 Diabetes in a 10km Run Competition. *International Journal of Sports Medicine*, *36*(10), 853–857. https://doi.org/10.1055/s-0035-1547263

Nieman, D. C., Kay, C. D., Rathore, A. S., Grace, M. H., Strauch, R. C., Stephan, E. H., … Lila, M. A. (2018). Increased plasma levels of gut-derived phenolics linked to walking and running following two weeks of flavonoid supplementation. *Nutrients*, *10*(11). https://doi.org/10.3390/nu10111718

Pedlar, C. R., Brugnara, C., Bruinvels, G., & Burden, R. (2018, Februari). Iron balance and iron supplementation for the female athlete: A practical approach. *European Journal of Sport Science*, Vol. 18, hal. 295–305. Taylor and Francis Ltd. https://doi.org/10.1080/17461391.2017.1416178

Rosen, H. E., Lynam, P. F., Carr, C., Reis, V., Ricca, J., Bazant, E. S., … Zoungrana, J. (2015). Direct observation of respectful maternity care in five countries: A cross-sectional study of health facilities in East and Southern Africa. *BMC Pregnancy and Childbirth*, *15*(1). https://doi.org/10.1186/s12884-015-0728-4

Ruder, E. H., Hartman, T. J., Reindollar, R. H., & Goldman, M. B. (2014). Female dietary antioxidant intake and time to pregnancy among couples treated for unexplained infertility. *Fertility and sterility*, *101*(3), 759–766.

Schroer, A. B., Saunders, M. J., Baur, D. A., Womack, C. J., & Luden, N. D. (2014). Cycling time trial performance may be impaired by whey protein and L-Alanine intake during prolonged exercise. *International Journal of Sport Nutrition and Exercise Metabolism*, *24*(5), 507–515. https://doi.org/10.1123/ijsnem.2013-0173

Ten Haaf, D. S. M., Flipsen, M. A., Horstman, A. M. H., Timmerman, H., Steegers, M. A. H., de Groot, L. C. P. G. M., … Hopman, M. T. E. (2021). The effect of protein supplementation versus carbohydrate supplementation on muscle damage markers and soreness following a 15-km road race: a double-blind randomized controlled trial. *Nutrients*, *13*(3), 1–16. https://doi.org/10.3390/nu13030858

Tokatlidou, C., Xirouchaki, C. E., Kostopoulos, N., & Armenis, E. (2021). Serial measurements of cortisol, creatine kinase, and TNF-α levels in elite basketball athletes during a training season. *Journal of Physical Education and Sport*, *21*(6), 3606–3611. https://doi.org/10.7752/jpes.2021.06487

Wasserfurth, P., Nebl, J., Schuchardt, J. P., Müller, M., Boßlau, T. K., Krüger, K., & Hahn, A. (2020). Effects of exercise combined with a healthy diet or calanus finmarchicus oil supplementation on body composition and metabolic markers—a pilot study. *Nutrients*, *12*(7), 1–16. https://doi.org/10.3390/nu12072139